

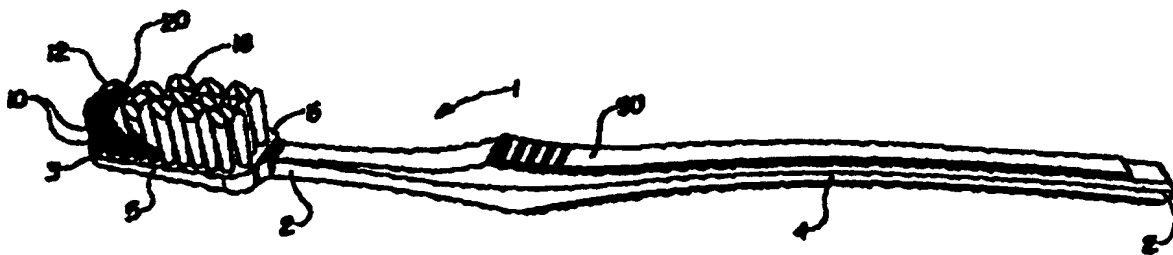
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(54) Title: TOOTHBRUSH EXHIBITING A GENERAL THREE-DIMENSIONAL BRISTLE PROFILE AND HAVING RAISED PROFILED OUTER TUFTS



(57) Abstract

The toothbrush has an elongate member (50) extending between two ends. The elongate member (50) has a head (5) at one of its ends. The head (5) has a plurality of tufts (10) comprising a multiplicity of bristles (20). The tufts (10) have proximal ends (11) attached to the head (5), distal ends (12) extending outwardly from the head (5) and sides extending between the distal and proximal ends (12). The distal ends (12) of the tufts (10) are angled downwardly from a peak so the adjacent tufts form a V-shaped profile when looking at the side of the tufts. The tufts (10) are arranged on the head (5) so as to define outer tufts (18), adjacent the outer perimeter of the head (5), and inner tufts (19). A predetermined number of the outer tufts (18) have their peaks extending further away from the head (5) than all of the peaks of the inner tufts (19) so as to provide improved inter proximal penetration.

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## TOOTHBRUSH EXHIBITING A GENERAL THREE-DIMENSIONAL BRISTLE PROFILE AND HAVING RAISED PROFILED OUTER TUFTS

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### FIELD OF THE INVENTION

The present invention relates to toothbrushes, and more particularly, to toothbrushes which exhibit a three-dimensional bristle profile to provide improved cleaning in inter proximal areas without increasing gum irritation.

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### BACKGROUND OF THE INVENTION

The fundamental purpose of toothbrushes is to remove plaque and debris from tooth surfaces, both along their outer surfaces and in the inter proximal areas as well as provide gum and inter dental stimulation. While most commercially available toothbrushes clean the outer surfaces of teeth adequately toothbrushes having a three-dimensional or "V" shaped profile, when viewed in side profile, render the toothbrush particularly adept at cleansing and stimulation.

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Recently, there has been a desire to provide a "V" shaped profile toothbrush which provides improved inter proximal penetration, especially at the gum line.

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### SUMMARY OF THE INVENTION

In accordance with the present invention there is provided a toothbrush which provides superior penetration/cleaning as well as gum and inter dental stimulation. The toothbrush has an elongate member extending between two ends. The elongate member has a head at one of its ends. The head has a plurality of tufts comprising a multiplicity of bristles. The tufts have proximal ends attached to the head, distal ends extending outwardly from the head and sides extending between the distal and proximal ends. The distal ends of the tufts are angled downwardly from a peak so that adjacent tufts form a V shaped profile when looking at the side of the tufts. The tufts are arranged on the head so as to define outer tufts, adjacent the outer perimeter of the head, and inner tufts. A predetermined number of the outer tufts have their peaks extending further away from the head than the peaks of all of the inner tufts so as to provide improved inter proximal penetration.

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### BRIEF DESCRIPTION OF THE DRAWINGS

While the specification concludes with claims which particularly point out and distinctly claim the invention, it is believed the present invention will be better understood from the following description of several particularly preferred

embodiments taken in conjunction with the accompanying drawings, in which like reference numerals identify similar elements and wherein;

Figure 1 is a perspective view of a preferred embodiment of the toothbrush in accordance with the present invention.

5        Figure 2 is a simplified side view of the head of the toothbrush shown in Figure 1.

Figure 3 is a front view of the head of the toothbrush shown in Figure 1.

### DETAILED DESCRIPTION OF THE INVENTION

10        In a particularly preferred embodiment seen in Figure 1, the present invention comprises a toothbrush 1, for achieving improved inter proximal cleaning and gum and inter dental stimulation. Toothbrush 1 includes an elongate member 50 extending between two ends 2 and 3. End 2 comprises a handle portion 4 and end 3 comprises a head 5 having outer perimeter 6. Handle 4 preferably has a non-slip grip area 104  
15        made from any suitable material known in the art including santoprene. For applications such as electric toothbrushes, the handle portion 4 may comprise suitable attachment means (not shown) for securing the brush to the driving means. Head 5 has a plurality of tufts 10 comprising a multiplicity of bristles 20. The tufts 10 are disposed on the head so as to define outer tufts 18, adjacent the outer perimeter 6 of  
20        head 5, and inner tufts 19. As seen from Figure 2 tufts 10 have proximal ends 11 attached to said head, distal ends 12 extending outwardly from head 5, and sides 13 extending between proximal end 11 and distal end 12. As seen from the figure distal ends 12 of tufts 10 are angled downwardly from peaks 14 so that adjacent tufts form a "V" shaped profile when looking at the sides 13. A predetermined number of outer  
25        tufts 18 have distal ends which extend outwardly from the head a greater distance than the distal ends of the inner tufts 19. This provides for improved inter proximal penetration, especially at the gum line. All of the bristles are preferably end rounded to protect gum tissue.

As seen from Figure 2 tufts 10 of toothbrush 1 form a straight-"V" shaped  
30        side profile having five peaks 14. For an adult sized toothbrush, the total number of V's preferably ranges from about three to about seven. The distance from the top of one V to another preferably ranges from about 0.16 inches to about 0.30 inches, and even more preferably, from about 0.19 inches to about 0.25 inches. The distance from the bottom to the top of the "V" is preferably about 0.14 inches with a range of  
35        from about 0.10 inches to about 0.17 inches. It is preferred that the tufts of each row are preferably aligned. The longitudinal row spacing, the longitudinal distance between adjacent tufts 18, as measured in a direction parallel to the length of elongate member 2 preferably ranges from about 0.02 inches to about 0.08 inches, and even

more preferably from about 0.04 inches to about 0.07 inches.

The bristles 20 in combination have a bristle stiffness which can be characterized numerically by the following equation:

$$\text{Bristle Stiffness} = \frac{D^2 E}{X^2} * \frac{(\# \text{ Bristles})}{1 \times 10^6}$$

where; D = bristle diameter, in inches

E = modulus of elasticity of the bristle material

when wet, e.g. for nylon this is a constant, 460,000 psi

X = average bristle length across the head 16 of the brush in inches

# bristles = total number of bristles on head 5

The bristle stiffness preferably ranges from about 0.2 to about 0.8.

The diameter "D" bristles 20 preferably ranges from about 0.006 inches to about 0.009 inches. Average bristle length preferably ranges from about 0.30 inches to about 0.55 inches and even more preferably from about 0.34 inches to about 0.44 inches. The total number of bristles 20 in the head 5 preferably from about 1,200 to about 5,000, and even more preferably from about 1,600 to about 3,500.

Buttressing is the tendency of adjacent bristles to support or buttress each other. The Buttress Factor of the brush, is achieved by dividing the cross-sectional area taken up by the bristles 20 by the total cross sectional area of the tufts 10 at the base. Numerically, the preferred Buttress Factor for brushes of the present invention ranges from about 0.8 to about 0.96.

A preferred method of achieving end rounded bristles 20 in a "V" shaped format is to first square cut or shear a group of bristles perpendicular to the length of the bristles. The cut ends of the bristles are then ground while in a common plane to remove any sharp or protruding edges from each bristle. The bristles are then moved relative to each other to produce a desired three-dimensional shape at the exposed end of the tuft. The attachment end of the bristles are then preferably square cut or sheared to the appropriate length. This method is further described in German Patent Application 3820372 which published on December 20, 1989, which is hereby incorporated herein by reference. The attachment end of the bristles is then preferably heated to form a molten mass and placed against the heated head. As the molten materials cool, the tufts are secured to the head. The latter method is further described in United States Patent 4,637,660 which issued on January 20, 1987 to Weihrauch, which is also hereby incorporated herein by reference.

As mentioned above a predetermined number of outer tufts 19 on head 5 have distal ends which extend above all of the distal ends of the inner tufts. In a preferred embodiment the outer tufts which have their distal ends extending above all of the distal ends of the inner tufts are those most adjacent the elongate member 50. This

provides for greater independent bristle action at the gum line for improved inter proximal penetration and cleaning. The extended outer tufts can ride along the gum line and penetrate and clean with reduced interference from the inner tufts. For a full size head of an adult tooth brush there are preferably 24 outer tufts, 12 on each side, of which half (12) of the outer tufts are extended above the inner tufts. Preferably, the back 6 tufts on either side are the ones which are extended. For a compact head toothbrush, as shown in the figures, there are preferably 20 outer tufts, of which the back 6 on either side are extended. The extended outer tufts are preferably have from about 0.5mm to about 2mm higher peak than the peaks of the inner tufts and they are most preferably have about 1mm higher peak than the inner tufts. Preferably the inner tufts have a peak height of about 11.5mm. The ratio of the peak height of the inner tufts versus the peak height of the extended outer tufts ranges from about 0.85 to about 0.96.

Although particular embodiments of the present invention having been shown and described, modification may be made to the toothbrush without departing from the teachings of the present invention. Accordingly, the present invention comprises all embodiments within the scope of the appended claims.

What is claimed is:

What is Claimed is:

1. A toothbrush comprising having an elongate member extending between two ends, the elongate member has a head at one of the ends, the head has an outer perimeter and a plurality of tufts disposed thereon, the tufts comprising a multiplicity of bristles, the tufts having proximal ends attached to the head, distal ends extending outwardly from the head and sides extending between the distal and proximal ends, the distal ends of the tufts are angled downwardly from a peak so that adjacent tufts form a V shaped profile when looking at the side of the tufts, the toothbrush characterized by:  
  
the tufts being arranged on the head so as to define outer tufts, adjacent the outer perimeter of the head, and inner tufts, wherein a predetermined number of the outer tufts have their peaks extending further away from the head than all of the peaks of the inner tufts.
2. The toothbrush according to Claim 1 wherein the predetermined number of outer tufts which have their peaks extending further away from the head than the peaks of the inner tufts are those most adjacent the elongate member.
3. The toothbrush according to Claim 1 wherein the head is oblong and defines a back, adjacent to the elongated member, a front and two sides.
4. The tooth brush according to Claim 3 wherein there are 22 outer tufts of which the 6 tufts on each side closest to the back of the head have their peaks extending further away from the head than the peaks of the inner tufts.
5. The toothbrush according to Claim 3 wherein there are 18 outer tufts of which the 6 tufts on each side closest to the back of the head have their peaks extending further away from the head than the peaks of the inner tufts.
6. The toothbrush according to any of the preceding Claims wherein the predetermined number of outer peaks which have their peaks extending further away from the head than the peaks of the inner tufts extend from about 0.5mm to about 2mm above the peaks of the inner tufts.

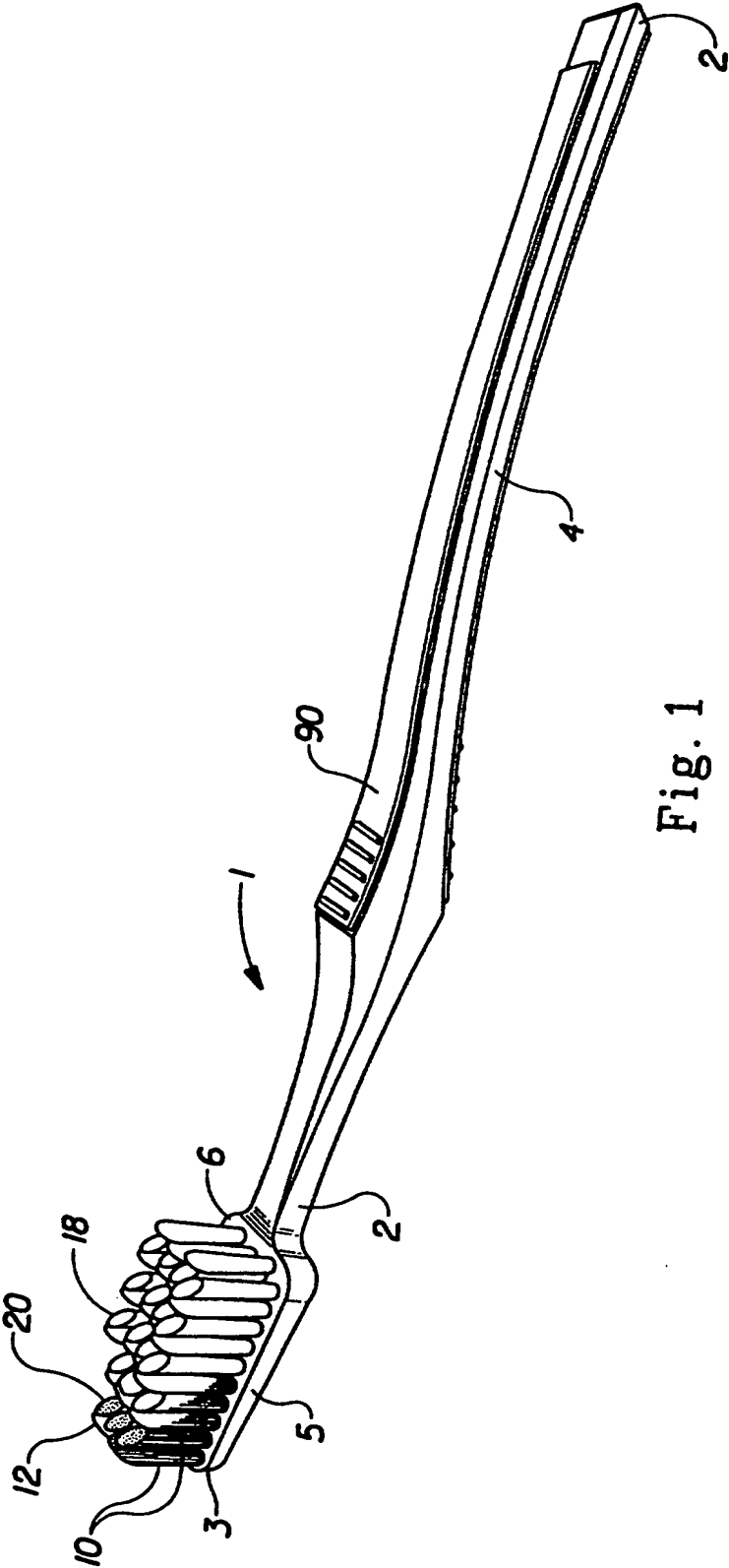


Fig. 1



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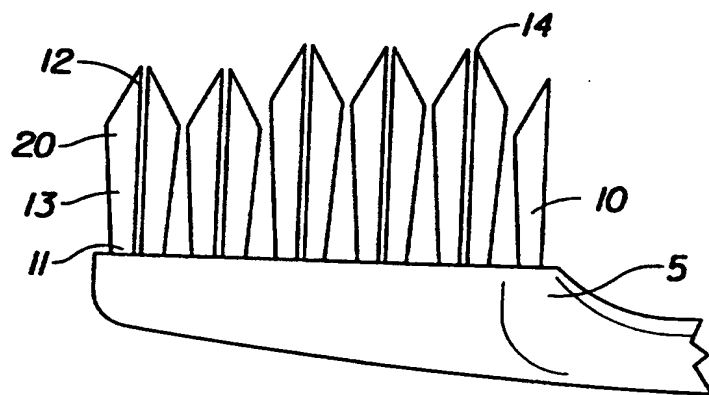


Fig. 2

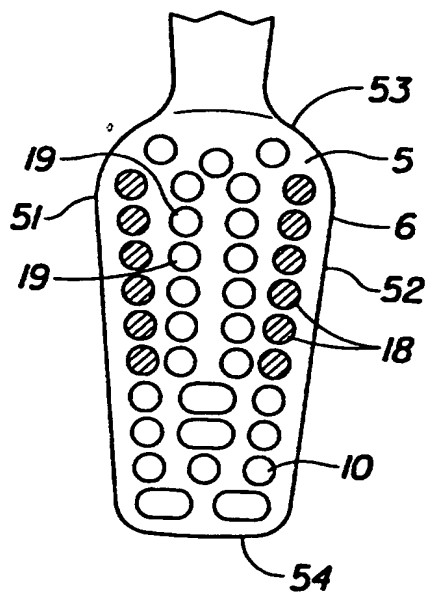


Fig. 3

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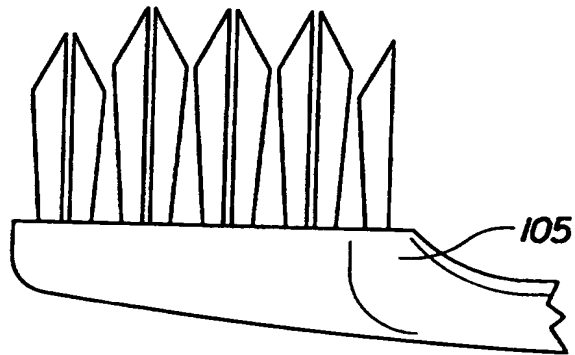


Fig. 4

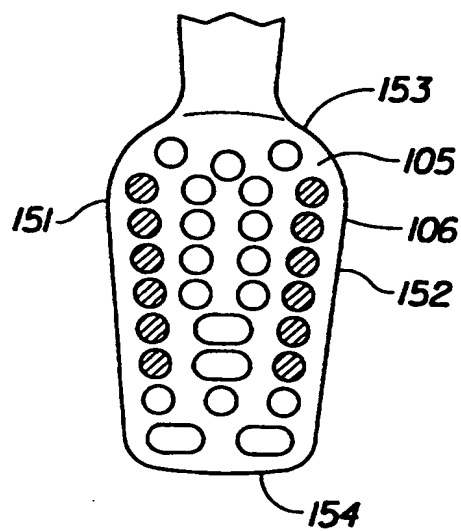


Fig. 5

# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 95/11310

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 6 A46B9/04

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 6 A46B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	DE,U,93 03 673 (VEREINIGTE BÜRSTENFABRIKEN) 6 May 1993 see page 7, line 7 - page 11, line 5; figures ---	1
Y	US,A,4 894 880 (AZNAVOORIAN) 23 January 1990 see column 2, line 43 - column 3, line 40; figures ---	1
A	FR,A,2 548 528 (JOUVIN) 11 January 1985 see figures ---	1
A	US,A,3 934 298 (KIM) 27 January 1976 see column 6, line 16 - column 8, line 19; figures ---	1
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

29 December 1995

Date of mailing of the international search report

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## INTERNATIONAL SEARCH REPORT

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-U-9303673	06-05-93	NONE	
US-A-4894880	23-01-90	NONE	
FR-A-2548528	11-01-85	NONE	
US-A-3934298	27-01-76	NONE	
US-A-5392483	28-02-95	NONE	